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Observations on certain Gall-making Coccidæ of Australia, by H. L. Schrader.

[Read 2nd June, 1862.]

As a preface to my observations upon this family of the *Homoptera* it will perhaps be as well to give a short review of the modern classification of the Order.

Westwood, following the views of Latreille, divides the *Homoptera* of MacLeay into three primary Sections.

1. Trimera. *Tarsi* 3—jointed; *antennæ* minute, setigerous; *wings* areolate.

(The *Cicada* may be taken as the type of this Section.)

2. Dimera. *Tarsi* 2—jointed; *antennæ* moderate, filiform, 5—10—jointed; *wings* subareolate.

(The *Aphis*, so well known as the destroyer of our most useful and admired vegetable productions, may be considered as the type of this Division.)

3. Monomera. *Tarsi* 1—jointed; *antennæ* 6—25—jointed; *wings* not areolate.

This last Section is composed of one family of *Coccidæ* or Cochineal insects, and as the insects which I am about to describe, show such a great difference in habits, as well as in structure, from those already known, I believe there is sufficient reason to form a second family of *Monomera*, characterized by making galls.

When I came to this Colony, I was astonished to find so great a number and variety of galls. At first I thought they were produced by *Cynipidæ*, but I soon ascertained that there were comparatively few *Hymenopterous* gall-makers here. Most of the *Hymenoptera* which I found in galls, were parasites upon gall-making *Diptera* and *Homoptera*.

The *Coccus-Galls* very frequently exhibit monstrosities in their growth, caused sometimes by the early death of the female inhabitant, in which case the orifice of the gall closes up, but sometimes they are owing to the parasitic attacks of numerous minute *Hymenoptera*.

The inhabitants of these galls are often exposed to the attacks of insects, particularly of *Hymenoptera*, allied to *Chalcis*.

I have also found a Curculionideous insect, which makes a large round hole in the galls of *Brachyscelis ovicola (mihi)*, but with what object I have not ascertained. The old galls become frequently the residence of spiders, and of some families of small ants with their eggs and larvæ.

The greater number of the galls of my genus *Brachyscelis*, I found on *Eucalyptus hæmastoma;* but other species, as *Eucalyptus corymbosa*, and *Angophora lanceolata*, are also infested by them.

Some of these galls attain an enormous size. I found one of the species *B. munita (mihi)*, where the length of the whole gall was eleven inches, and the thickest part eight lines wide. One gall of my species *B. duplex* was six inches and a-half long, and the greatest width eighteen lines. The living female which I took from it was fifteen lines long, the largest I ever saw; I found it on a sapling of *Eucalyptus hæmastoma*, but I have seen them also on other species of *Eucalyptus*.

All these insects, when they appear in great numbers, become

very destructive to the young *Eucalyptus* branches. I have seen whole patches of ground, often a hundred feet square, where the young trees were totally destroyed by the attacks of *B. pharetrata* and *ovicola*. In such a case the leaves remain small, the branches become crippled, and finally die, on account of the number of *Coccus* galls which take up the sap of the plant.

Pl. I. fig. 1. Shows a branch of *Eucalyptus hæmastoma*, with excrescences made by *Brachyscelis pileata*. The trumpet-shaped excrescences fig. 1. a. contained each one winged male, and each of those upon the stem, contained one apterous female. The sketch shows the gall in different stages. Fig. 1. b. is a young gall; Fig. 1. c. one which perished early, for want of nourishment. Fig. d. shows one more developed, and of which the outside shell, together with its pointed cap, is coming off. (Owing to this peculiarity I gave the species the name of *pileata*.)

As soon as this cap has fallen off, the gall appears in its ultimate form Pl. I. e. & g. This takes place in March or April. At the end of the gall is found an opening or notch, such as might be made with a knife. Through this orifice the female receives air, and also the larvæ escape.

The female *Brachyscelis* is placed with its abdominal appendages, which consist of two spines, furnished on the end with some hairs, towards the orifice Fig. g., and on the approach of any insect, it immediately assumes a rotatory motion, and cleans the orifice with those two horny points. The orifice is always surrounded with a white farinose matter, or manna, which the animal continually reproduces. Fig. g. will show such a gall, and Fig. f. the *ovo-viviparous* female (natural size) taken from it, in the act of bringing forth the young larvæ. It produces countless numbers; the whole animal is filled with them, and when they are all deposited, nothing remains but the bladder-like skin. This female is of a dirty yellowish colour, and is also covered with a white powder. The anal orifice is situated between the two spines, and the manna or farinose matter which exudes therefrom, I consider as nothing but the excrement of the animal.

The two anterior legs are situated above the mouth, which appears to be obsolete, as I could not distinguish any *promuscis*. A little higher than the anterior legs, are situated the minute

antennæ, while again higher and wider apart, we find the eyes, set in a kind of furrow.

Pl. I. h. Is a larva as it appears shortly after birth, and fig. 1. the larva in the perfect state, one day old, (both greatly magnified.) The larva is flat, nearly transparent, and of a yellow colour. The sides are ornamented with hairs formed into one row, and two long anal setæ. The antennæ are about half the length of the body, consisting of seven joints, and on the tip armed each with two small and two long hairs. The tarsi consist of three joints, the last joint forming a claw, also furnished with some small hairs.

In some species, as *Brachyscelis pileata*, *B. ovicola* and *B. duplex* the male larvæ settle on the leaves, and produce trumpet-like swellings. Pl. I. a. and Pl. II. a.

The excrescences caused by the female larvæ, are generally to be found on the sprays of young branches,* (Pl. 1. fig. c. and r.) evidently a provision of nature to secure an ample supply of sap for the future growth of the insect, as these females occupy their galls for a year.

In the species *B. pharetrata* (Pl. I. 2.) the young male larvæ abandon the home of the mother, and settle in great numbers on the outside crust, but always on the under side; here they produce a swelling through irritation, which soon becomes a crimson gall. It then opens like a flower, and often in the shape of a cockscomb. (Pl. I. o.) The old gall has to provide sufficient juice to nourish the new one, which becomes even larger than the house of the parent. This last formed gall is throughout of the same colour, and as it consists of a soft matter, the larvæ dig easily into it, and after having there changed into a second active form, with short antennæ, and very short anal setæ, they soon become transformed into pupæ, and perfect male insects. (Pl. I. p. greatly magnified.)

As soon as the male insect becomes mature, the upper surface of the new excrescence shows a number of small cells, and from each a male escapes, with its anal setæ foremost, and the wings extended over the head.

This male is about two lines long, of a yellow colour, and having monomerous tarsi, (Pl. I. s.) ending in two claws, one

being stronger than the other. The anal setæ are nearly twice as long as the body; the wings contain two longitudinal nerves. The antennæ have ten principal joints, which are neither very distinct nor regular. The eyes are prominent. The mouth, (Pl. I. q.) contains organs, the use of which I have not been able to ascertain.

The young larvæ make their appearance in November, and the perfect males in the following March. This shows that the females live about eight months, after being impregnated by the winged males, which live only a very short time.

Pl. I. r. Shows female galls of *B. pharetrata* three months old, and one month after what I suppose to be the period of impregnation.

The female larva digs into the young shoots, not so often into the leaf, and changes into the pupa state; it then becomes inactive, and assumes the shape of a heart. The legs are in rather longer proportion, than those of the insect in the other stages. With the growth of the gall the pupa changes into the perfect female; it is at that time still very small, but lively, and grows larger and larger with the gall, till it attains the full size. (Pl. II. g. female *B. pharetrata* magnified.)

The different names of species, as *pileata*, *pharetrata*, *ovicola*, *munita*, *citricola*, *duplex*, &c., I gave chiefly in relation to the external appearance of the galls, as the insect itself does not always show sufficiently marked distinctions, except in point of size and colouring, two points upon which but little dependence can be placed.

Pl. II. fig. a. Shows a branch of *Eucalyptus hæmastoma* with several male galls and one young female gall of *B. ovicola*.

Pl. II. e. A longitudinal section of a full-grown gall, showing the position of the female. Fig. f. Is the female taken from it (greatly magnified.)

The male of the species *ovicola* is larger than that of the *pharetrata*, stronger in the abdomen, the first 4 or 5 segments being as broad as the thorax; the others are tapered, terminating with an elongated style, and two long anal setæ. It is of a yellow colour.

Pl. II. fig. h. Shows the female gall of *B. Duplex*. Fig. 1. the

shape of the cavity occupied by the female, and fig. o. the female taken therefrom, natural size. Fig. s. the gall of the male insect.

The sketch x. shows a gall of *B. munita*.

There are other species of smaller gall-making *Cocci*, in which both male and female excrescences are on the same leaves. The males are of a red colour, some with and some without anal setæ, and the females with very long posterior legs, the anterior and intermediate missing.

I intend to make these insects the subject of my next paper, which will also include another genus of gall-makers, in which the male larvæ undergo their metamorphosis, in the gall of the mother, and where the females lose nearly all traces of articulation, becoming fixed masses of animal matter, without apparent limbs, or sign of vitality.

Further communication on the gall-making Coccidæ, by H. L Schrader.

[Read July 7th, 1862.]

In my last paper I gave you the result of my observations on the genus which I have named *Brachyscelis*. I now proceed to the description of some insects so remarkable in their form, that I have ranked them as composing distinct Genera.

I propose therefore to divide the gall-making *Coccidæ* as follows :—

1. Genus. *Brachyscelis*. Where the females have six legs complete, but short, and unfit for use.

2. Genus. *Opisthoscelis*. Where they have only two long posterior legs.

3. Genus. *Ascelis*. Where there are no vestiges of legs.

The galls of the insects of the genus *Opisthoscelis* are often